ARKANSAS' NANO-ECONOMY

Q&A WITH DR. MIN ZOU, UNIVERSITY OF ARKANSAS

By AMP Staff

Nanomaterials may be too small to view with the naked eye, but their value to Arkansans is evident every day. From increasing the efficiency of conveyor belts to promoting the growth of stem cells to repair brain injuries, nanotechnology is opening incredible doors in the Natural State.

Dr. Min Zou, a 2016 Arkansas research alliance fellow and member of the ARA Academy, is a professor of mechanical engineering at the University of Arkansas and a faculty member of the Institute for Nanoscale Science and Engineering and the interdisciplinary Microelectronics-photonics (microEP) Graduate Program at the UA. She and her team are using the tiniest materials to make enormous impacts on Arkansas' economy.

Dr. Min Zou

AMP: In a few words, describe your field of research.

Dr. Zou: The world is full of surfaces interacting with each other. My research focuses on enhancing these interactions through nanoscale surface engineering.

AMP: You said "nanoscale." What does that mean?

Dr. Zou: "Nanoscale" refers to structures with dimensions measured in nanometers (nm), or 10-9 meter (m). To provide perspective, imagine the thickness of a sheet of paper. Its thickness is around 100,000 nanometers. My work involves creating nanostructures and films on surfaces to enable various properties and functions. While nanostructures are extremely small, the impact of nanoscale research is huge.

AMP: How is this field of research meaningful to Arkansas companies and Arkansans in general?

Dr. Zou: Materials with nanoscale dimensions (typically less than 100 nm) show novel physical, chemical, mechanical and optical properties that bulk materials do not have. These novel properties can be used to create materials or surfaces with specific functions for many products and services that impact Arkansas companies and the public.

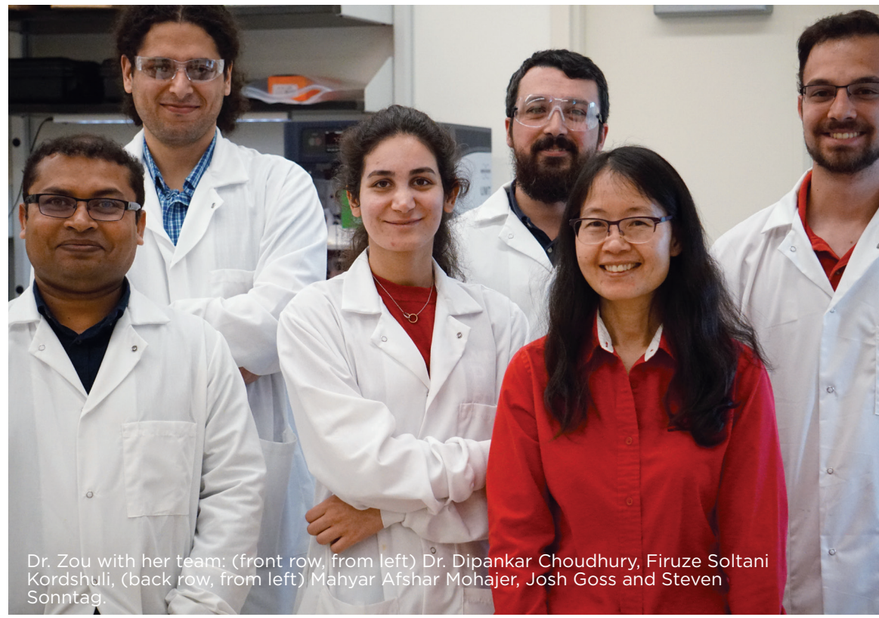
For example, nanotechnology can be used to create low friction coatings that can help Arkansas companies reduce energy consumption. Controlling the surface of glass, or other transparent materials, at the nanoscale enables more light to be transferred (anti-reflective) which boosts performance of solar cells and LED lighting. Broadly speaking, nanotechnology can improve areas such as transportation, materials handling, renewable energy, medicine, health care and more.

AMP: How is your research being applied specifically to local companies?

Dr. Zou: My research lab has developed several surface-engineering technologies that have led to the formation of two local startup companies — SurfTec LLC and WattGlass LLC — working on commercializing some of these technologies. SurfTec has developed low-friction coatings and anti-icing/icephobic coatings that can be applied in a wide range of applications. To date, this includes lubricant sprays for industrial applications and ski waxes for consumer applications.

Recently, SurfTec worked with Allied Cycle Works in Rogers to develop a product that can improve the energy efficiency of bicycle chains. We also are working with Hytrol Conveyor Company in Jonesboro to improve conveyor system energy efficiency. SurfTec's anti-icing/icephobic coating could help prevent the devastating disaster caused by ice accretion on power generation systems and prevent power outages, like the one we saw in February due to the severe weather.

WattGlass develops anti-reflective, anti-fogging and self-cleaning coatings, which are applied to solar panels and streetlights to improve the energy efficiency of these products. We hope to continue to apply these and new technologies to benefit the state of Arkansas.



Dr. Zou with her team: (front row, from left) Dr. Dipankar Choudhury, Firuze Soltani Kordshuli, (back row, from left) Mahyar Afshar Mohajer, Josh Goss and Steven Sonntag.

AMP: You serve as the director for the Nano Mechanics and Tribology Laboratory (NMTL) and have a track record of converting promising research into real-world applications. What does the future look like for NMTL?

Dr. Zou: NMTL will continue to conduct cutting-edge research in nanoscale surface engineering through various advanced manufacturing techniques. We are using several new technologies, such as 3D nanoprinting and laser processing, to give researchers more power to tailor material properties toward new applications. A particular focus is on biomedical applications, which include orthopedic implants, scaffolds and organ-on-a-chip devices.

We will continue to commercialize technologies developed in our lab by providing students with entrepreneurship training and leveraging partnerships with companies around the world.

AMP: What is needed to turn research into commercial impacts? What challenges or friction points (no pun intended) exist that make this more challenging?

Dr. Zou: In order to create commercial impacts, research must lead to technologies that are reproducible, scalable and competitive in the marketplace. Crucial to this process are researchers with an entrepreneurial spirit who are passionate about taking new technologies to market.

In my experience, funding support for customer discovery and prototype development are the key challenges. That's why programs like ARA Impact Grants and the UA Chancellor's Discovery, Creativity and Collaboration Fund are so important. Not only do they allow us to investigate new types of research and develop early data, they also enable us to conduct commercially-oriented proof-of-concept and prototype development.

The research and talent in Arkansas successfully compete on a global stage, and it is vital that students and startups are supported, otherwise they go elsewhere for opportunities.

AMP: How can we attract, retain and develop talented and diverse people to research roles? How can we make research appealing for everyone?

Dr. Zou: We could identify talented students early, in grades 7-12, from diverse backgrounds through partnerships with various talent search programs and provide them with research opportunities and graduate student mentors.

The TRIO program funded by the U.S. Department of Education is one example, where two-thirds of students are from low-income backgrounds and would be in the first generation of their family to attend college. At later stages, we could provide undergraduate research opportunities and fellowships to students from traditionally underrepresented groups in science, such as women and minorities.

The Arkansas Research Alliance Academy of Scholars and Fellows is a community of strategic research leaders who strive to maximize the value of discovery and progress to advance the knowledge-based economy of the state. Learn more at ARAlliance.org. Mantooth will present at ARA Project Scope in March.